Assignment No. 5

Ordinary Differential Equations and Differential Algebraic Equations

Q1) Solve analytically (symbolically) using ***dsolve*** function of Matlab

1. 2y+ t = dy/dt
2. dy/dx=2y+y^2 ,with initial condition y (0)= 1

Q2.) Get solution for following ODE's using ***ode45*** solver

1) $dx1/dt = 2x2$; $dx2/dt = 2(x1) + 4(x2) - 6$

2) $\frac{dy1}{dt} = 2(y1)^2 + 6(y2) + 6$; $\frac{dy2}{dt} = y2^2 + 4(y2) + 3$ ...Use initial guess (1,1)

Q3.) Get solution for following first order equation with the help of ***ode45***, Initial conditions is

x(0)=1, for 0 < t < 20 plot the results with proper label and title.

dx/dt =-4x

Q4.) Solve following ODE with help of ode45 for $0 \leq t \leq 8$

$$\dot{x}\begin{bmatrix}-5 & 0 & -100\\ 2 & -2 & 0\\ 0 & 0.1 & -.08\end{bmatrix}x + \begin{bmatrix}0\\ 0\\ -0.1\end{bmatrix}(0.2), \qquad x(0) = \begin{bmatrix}0\\ 0\\ 0\end{bmatrix}$$

Q5.) Solve following simultaneous diff. equation for 0 < t< 5....using ode23s.

$$\begin{bmatrix}\dot{x}1\\ \dot{x}2\end{bmatrix} = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x1\\ x2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u; \quad x(0) = \begin{bmatrix}1\\ 0\end{bmatrix} \text{ and } u=1$$

Q6.) Solve a system of non-linear equations using the fsolve function in Matlab

$3x^3 - 2x^2 + x - 7$ take initially (x0) =1

Q.7) F(1) = exp(-exp(-x(1)+x(2))) - x(2)*(1+x(1)^2);

F(2) = x(1)*cos(x(2)) + x(2)*sin(x(1)) - 0.5;

Write a function to solve the above specified equation with help of 'fsolve', initial guess (0, 0).

Q8.) Get solution for following first order equation with the help of ODE23, Initial conditions is

y(0)=0, for 0 < t < 5 plot the results with proper label and title.

dy/dt =2t .